



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/586,996

07/21/2006

Takanori Miyasaka

Q96096

3135

65565 7590 05/13/2010  
SUGHRUE-265550  
2100 PENNSYLVANIA AVE. NW  
WASHINGTON, DC 20037-3213

EXAMINER

VO, HIEN XUAN

ART UNIT

PAPER NUMBER

2863

NOTIFICATION DATE

DELIVERY MODE

05/13/2010

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

SUGHRUE265550@SUGHRUE.COM  
USPTO@SUGHRUE.COM  
PPROCESSING@SUGHRUE.COM

<b>Office Action Summary</b>	<b>Application No.</b> 10/586,996	<b>Applicant(s)</b> MIYASAKA ET AL.	
	<b>Examiner</b> HIEN X. VO	<b>Art Unit</b> 2863	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 21 July 2006.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☐ Claim(s) 1-37 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 18, 19 and 35 is/are allowed.
- 6) ☒ Claim(s) 1-13, 17, 20-34, 36 and 37 is/are rejected.
- 7) ☒ Claim(s) 14 and 15 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 August 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>07/21/06</u> .  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Information Disclosure Statement***

1. The information disclosure statement (IDS) submitted on 07/21/2006. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-3, 6-13, 16-17, 23-28, 32-34, 36-37 are rejected under 35 U.S.C. 102(b) as being anticipated by Quist et al. (US Patent No. 6,199,018).

4. With respect to claim 1, Quist discloses distributed diagnostic system including a detecting portion fixed to the rotating or sliding part or the stationary member (see e.g. col. 2, lines 12-35) and including at least one vibration system sensor of a vibration sensor, a sound sensor, an ultrasonic sensor and an AE sensor; and a temperature sensor (see e.g. Fig. 2B, col. 8, lines 20-35 and col. 9, lines 1-18); and a signal processing portion for determining a state of the part from a detecting signal outputted by the detecting portion (see e.g. col. 8, lines 14-18); wherein the signal processing portion determines presence or absence of a abnormality of the part, or presence or absence of the abnormality of the part and a degree of a damage based on a

Art Unit: 2863

combination of a measured result by the vibration system sensor and a measured result by the temperature sensor (see e.g. Figs. 9-1 and 9-2 and col. 15, lines 61-67 and col. 16, lines 1-27).

5. with respect to claim 2, Quist discloses the invention as claimed including measured values by the vibration system sensor and the temperature sensor or rates of changes of the measured values over time are calculated at least by once (see e.g. col. 21, lines 40-65); wherein the signal processing portion includes a abnormality determining portion for determining presence or absence of the abnormality, or presence or absence of the abnormality determining portion and the degree of the damage by comparing the measured values or the rates of the changes with predetermined values (see e.g. col. 22, lines 57-67).

6. With respect to claim 3, Quist discloses the invention as claimed including a driving unit for driving the rotating or sliding part (see e.g. col. 23, lines 40-49); detecting portion fixed to the part or the stationary member and including at least one of at least one vibration system sensor of a vibration sensor, a sound sensor, an ultrasonic sensor and an AE sensor; and a temperature sensor (see e.g. Fig. 2B, col., lines 14-67 and col. 9, lines 1-18); and a signal processing portion for determining a state of the part from a detecting signal outputted by the detecting portion (see e.g. col. 8, lines 14-18); the signal processing portion diagnoses a abnormality of the part based on the detecting signal of a vibration or a temperature by the detecting portion when the part is moved by inertia within a predetermined speed zone when a power of the driving unit is turned off (see e.g. col. 23, lines 36-66).

Art Unit: 2863

7. With respect to claims 6-8, Quist discloses the invention as claimed including the driving unit is used by repeatedly turning on and off the power of driving unit, and the part is movable by inertia when a power of the driving unit is turned off (see e.g. col. 23, lines 40-46); a state of moving the part by inertia when a power of the driving unit is turned off is detected based on an OFF signal of the driving unit (see e.g. col. 23, lines 43-48); a rotational speed sensor for detecting a rotational speed of the driving unit (see e.g. col. 27, lines 48-50), wherein the abnormality of the part is diagnosed in cooperation with a detecting signal of the rotational speed by the rotational speed sensor and the detecting signal of the vibration or the temperature by the detecting portion (see e.g. col. 24, lines 8-20).

8. With respect to claim 9, Quist discloses the invention as claimed including comparing and checking portion for comparing a frequency component owing to damage of the part calculated based on the rotational speed signal and a frequency component of measured data based on the signal detected by the vibration system sensor (see e.g. col. 15, lines 32-52); and an abnormality determining portion for determining presence or absence of the abnormality of the part and specifying a damaged portion (see e.g. col. 17, lines 36-47).

9. With respect to claim 10, Quist discloses the invention as claimed including a filter processing portion for removing an unnecessary frequency band from a signal waveform detected by the vibration system sensor (see e.g. Fig. 4); an envelope processing portion for detecting an absolute value of the waveform which after being subjected to a filter processing transmitted from the filter processing portion (see e.g.

Art Unit: 2863

Figs. 10A-10B); and a frequency analyzing portion for analyzing a frequency of the waveform transmitted from the envelope processing portion (see e.g. col. 21, lines 40-58).

10. With respect to claim 11, Quist discloses the invention as claimed including at least one detecting portion for outputting a signal generated from the machine equipment as an electric signal (see e.g. Fig. 2B, items 34a-36); and a signal processing portion for: analyzing a frequency of a waveform of the electric signal (see e.g. col. 8, lines 14-18); sampling a peak of a spectrum larger than a reference value calculated based on the spectrum provided by analyzing the frequency (see e.g. Fig. 14, col. 15, lines 23-31); comparing and checking a frequency between the peaks and a frequency component owing to a damage of the part calculated based on a rotational speed signal or a moving speed signal (see e.g. col. 15, lines 34-43); and determining presence or absence of a abnormality of the part and an abnormal portion based on a result of the checking (see e.g. col. 17, lines 36-47).

11. With respect to claim 12, Quist discloses the invention as claimed including the signal processing portion subjects the detected signal to at least one of an amplifying processing and a filter processing and the signal processing portion subjects thus processed waveform to an envelope processing (see e.g. Fig. 4).

12. With respect to claim 13, Quist discloses the invention as claimed including at least one detecting portion for outputting a signal generated from the machine equipment as an electric signal (see e.g. Fig. 2B, items 34a-36); and a signal processing portion for determining presence or absence of a abnormality and an

Art Unit: 2863

abnormal portion of the part based on a frequency of a shockwave in which a waveform of the electric signal per unit time exceeds a threshold, and a rotational speed signal or a moving speed signal (see e.g. Figs. 3-4 and col. 14, lines 41-60).

13. With respect to claim 17, Quist discloses the invention as claimed including at least one detecting portion for outputting a signal generated from the machine equipment as an electric signal (see e.g. Fig. 2B, items 34a-36); and a signal processing portion for: analyzing a frequency of a waveform of the electric signal, comparing and checking a frequency component of a measured spectrum data provided by analyzing the frequency and a frequency component owing to the part with a variable allowable width (see e.g. col. 14, lines 55-67 and col. 15, lines 1-31); and determining presence or absence of a abnormality and an abnormal portion of the part based on a result of the checking (see e.g. col. 17, lines 36-47).

14. With respect to claim 23, Quist discloses the invention as claimed including at least one detecting portion for outputting a signal generated from the machine equipment as an electric signal (see e.g. Fig. 2B, items 34a-36); and a signal processing portion for: analyzing a frequency of a waveform of the electric signal (see e.g. col. 14, lines 41-54); comparing and checking a frequency component of a measured spectrum data provided by analyzing the frequency and a frequency component owing to the part (see e.g. col. 15, lines 7-16); and determining presence or absence of a abnormality and an abnormal portion of the part based on a result of the checking (see e.g. col. 17, lines 36-47); wherein a reference value used for the

Art Unit: 2863

comparing and checking is calculated based on a limited frequency range of the measured spectrum data (see e.g. col. 16, lines 1-22).

15. The claims 32, 34, 36 are method claims that are similar in scope to claims 11, 23. They are therefore considered rejected for the reasons as set forth above.

16. With respect to claim 16, Quist discloses the invention as claimed including the signal processing is executed when a rotational speed of the part is substantially constant (see e.g. col. 4, lines 56-67).

17. With respect to claims 24, 37, Quist discloses the invention as claimed including at least one detecting portion for outputting a signal generated from the machine equipment as an electric signal (see e.g. Fig. 2B); a signal processing portion for analyzing a frequency of a waveform of the electric signal (see e.g. Fig. 2B, item 28); comparing and checking a frequency component of a measured spectrum data provided by analyzing the frequency and a frequency component owing to the part (see e.g. col. 15, lines 32-52); and determining presence or absence of a abnormality and an abnormal portion of the part based on a result of the checking (see e.g. col. 16, lines 61-65); a storing portion for storing a result of a diagnosis diagnosed by the signal processing portion (see e.g. col. 16, lines 23-36); an outputting portion for outputting the result of the diagnosis in a predetermined style (see e.g. col. 29, lines 34-50); and a report forming portion for forming a report from an outputted result outputted by the outputting portion based on at least one program (see e.g. Fig. 13, step 136).

18. With respect to claims 25-26, Quist discloses the invention as claimed including the detecting portion includes an integrated type sensor, in which at least one of the



Art Unit: 2863

temperature sensor for detecting the temperature of the machine equipment and a rotational speed sensor for detecting the rotational speed of the rotating part, is installed in a single case in addition to a sensor for detecting a vibration generated from the machine equipment (see e.g. Figs. 2A, item 22; 2B); the machine equipment includes a bearing constituting the rotating part and a bearing box for fixing the bearing (see e.g. col. 8, lines 20-36); wherein the integrated type sensor is fixed to a fat portion of the beating box (see e.g. Fig. 2A, item 2A).

19. With respect to claims 27-28, Quist discloses the invention as claimed including data transmitting unit which transmits a result of a determination by the signal processing portion (see e.g. col. 7, lines 15-19); a microcomputer which carries out a processing by the signal processing portion, and a processing of outputting the result of the determination to a control system (see e.g. col. 7, lines 40-52).

20. With respect to claim 33, Quist discloses the invention as claimed including detecting a signal generated from the machine equipment and outputting the signal as an electric signal (see e.g. col. 3, lines 57-65); and detecting presence or absence of a abnormality of the part based on a frequency of a shockwave in which a waveform per a unit time period of the electric signal exceeds a threshold and a rotational speed signal or a moving speed signal ((see e.g. col. 16, lines 1-22).

### ***Claim Rejections - 35 USC § 103***

21. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

Art Unit: 2863

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 4-5, 20-22, 29-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Quist et al. (US Patent No. 6,199,018).

22. With respect to claim 4, Quist discloses distributed diagnostic system including a driving unit for driving to rotate the part (see e.g. col. 23, lines 40-49); a detecting portion fixed to the part or the stationary member and including at least one of: at least one of vibration system sensor of a vibration sensor, a sound sensor, an ultrasonic sensor and an AE sensor; and a temperature sensor (see e.g. Fig. 2B, col., lines 14-67 and col. 9, lines 1-18); and a signal processing portion for determining a state of the part from a detecting signal outputted by the detecting portion see e.g. col. 8, lines 14-18); wherein the signal processing portion diagnosis a abnormality of the part based on the detecting signal of a vibration or a temperature by the detecting portion when the part is rotated within a rotational speed (see e.g. col. 24, lines 8-20). Quist does not clearly disclose the speed zone  $100 \text{ min}^{-1}$  or faster and  $1500 \text{ min}^{-1}$  or slower. However, Quist discloses the signal processing portion diagnosis a abnormality of the part based on the detecting signal of a vibration or a temperature by the detecting portion with the erractic load and speed changes (see e.g. col. 25, lines 32-55, col. 26, lines 1-13). Therefore, it would have been obvious to one of the ordinary skill in the art at the time the invention was made to run the electric machine at the different speed as taught by Quist to detect the abnormal of the part based on the detecting signal of

Art Unit: 2863

vibration or a temperature on the electric machine in view of their closely related structures and the resulting expectation are the same.

23. With respect to claim 5, Quist discloses the invention as claimed including The signal processing portion diagnoses the abnormality of the part based on the detecting signal of the vibration or the temperature by the detecting portion when the part is rotated by inertia within the rotational speed zone without turning off a power of the driving unit (see e.g. col. 26, lines 25-34).

24. With respect to claims 20-22, Quist discloses the invention as claimed but does not clearly disclose the allowable width is increases as the frequency component becoming a high frequency component; the allowable width is increases or decreased in accordance with a frequency band of the frequency component; the allowable width is increased or decreased in accordance with the rotational speed. However, Quist discloses the neural network in which a global self-correcting predictive algorithm to determine and predict machine operation (see e.g. col. 5, lines 36-45) and the filters and FFT to identify the peak frequencies of the electric machine (see e.g. col. 15, lines 7-31). Therefore, it would have been obvious to one of the ordinary skill in the art at the time the invention was made to use the neural network, filters and FFT as taught by Quist to self-correcting the operating of the electric machine at the different speeds for the purpose of being able to recognize and accurately test the rotary machine.

With respect to claims 29-31, Quist discloses the invention as claimed but does not disclose the machine equipment is a bearing unit for a railway vehicle, a windmill and a spindle of a machine tool. However, Quist discloses the rotating machine such as

Art Unit: 2863

motor (see e.g. col. 1, lines 10-20). Therefore, it would have been obvious to one of the ordinary skill in the art at the time the invention was made to use the rotating machine as taught by Quist in place of the bearing unit for a railway vehicle, a windmill, and a spindle of a machine tool as a matter of obvious engineering choice (see e.g. col. 1, lines 10-33).

### ***Allowable Subject Matter***

25. Claims 14-15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

26. The following is a statement of reasons for the indication of allowable subject matter:

27. For claim 14, the reasons of allowable are the signal processing portion subjects the waveform of the electric signal to a filter processing and converts the waveform to an all time rectified waveform, whenever the waveform exceeding the threshold, the signal processing portion makes a waveform which is converted so as to hold the waveform at a value exceeding the threshold for a predetermined period of time according to the rotational speed signal, and the processing portion informs a possibility of bringing about the abnormality in the part according to a number of times in which the waveform exceeds the threshold per a predetermined rotational number.

28. Claims 18, 35 allowed.

29. The following is an examiner's statement of reasons for allowance:

Art Unit: 2863

For claim 18, the reasons for allowance are a zone having an upper limit and lower limit, both of which are calculated from the rotational speed of the rotating part and dimensional specification of the rotating part, is divided into at least one zone, a central value in the divided zone is calculated, and the allowable width is set as at least a zone having an arbitrary size which is given with respect to the central value, and wherein the signal processing portion compares and checks the frequency component of the measured spectrum data and the frequency component owing to the rotating part at least at each of the allowable width.

For claim 35, the reasons for allowance are setting at least one allowable width such that: a zone having an upper limit and lower limit, both of which are calculated from the rotational speed of the rotating part and dimensional specification design of the rotating part, is divided into at least one zone, a central value in the divided zone is calculated, and the allowable width is set as at least a zone having an arbitrary size which is given with respect to the central value; comparing and checking a frequency component of a measured spectrum data provided by analyzing the frequency and a frequency component owing to the rotating part at each of at least one of the allowable width.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Art Unit: 2863

Any inquiry concerning this communication or earlier communications from the examiner should be directed to HIEN X. VO whose telephone number is (571)272-2282. The examiner can normally be reached on M-F (9:00-5:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew A. Dunn can be reached on (571) 272-2312. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Hien Vo  
05/10/10

**Drew A. Dunn**  
**/Drew A. Dunn/**  
**Supervisory Patent Examiner, Art Unit 2863**